

1955 4

IK-2

doc. 467

**UNITED STATES  
DEPARTMENT OF THE INTERIOR  
DI-6**

**APPROVED DECEMBER 1941**

K. M. Waage 1955 Notebook #4 doc. 467  
 Inyan Kara study #2

	Locality W-12	
	(Notes on Robinson-Theobald I.K. section (# I.K. 2) —	1.
7427	Route 116 reconnaissance S. of Sundance —	4.
	Brief of Robinson-Mepel Cabin Creek section —	6.
	W-13. Cabin Cr. section re-examination —	7.
7427	W-14 Sturgis section —	17
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	Edgemont area with Garland Gott (in part, cont in Mbk #5, IK #3) —	56
	W-21 Type Fall River section —	57.
	<u>4636</u> VP only	

Look at Arch Creek - porcellanite?  
Calc. Mervish.



Possible criteria for M-FL contact.

1. Base cglte ss
2. Highest calc. beds
3. Lowest dk gray or carb clstn beds
  - a. color
  - b. degree
4. Color, size, in clstns.
5. Key beds such as conc. zones, porcellanites.

Locality W-12

W-12 (In upper section of Robinson and  
Huebner)

Part A. In section below hill of mers.  
section and that to the SE  
(where was little and small block  
Fall River on SE)

Wash

5.0 claystone, red, plastic

0-1± conglomerate or coarse to  
coarse ss., loc. calc.

0.6 white, hard, platy sandstone  
weathers in white chips &  
flakes. May be puerillanitic  
not calc. has some chert  
granules.

5.3 claystone, red, soft, hard, green  
and yellow mottling at top

10.3 claystone as below but chert  
light <sup>greenish</sup> ~~gray~~, some  
red mottling at base, yellow  
in upper part

Locality W-12

11.3 Sandstone, med-coarse gr. fizzes  
white to yellowish, and  
weathered slopes locally brown,  
vertical in upper part

9.8 Claystone, sandy and sug.   
sandstone, partially wash  
covered. Upper 2' is  
sandy, hard clstn, var.  
red + green, with zones to  
fine grains of light, upper  
0.6 white locally; below  
some yellow, red + green  
shale or grayish to  
brown. The 0.6 white  
zone in fine gr. lam. ss  
loc. with some of var.  
clstn in lenses in it.

2.0 - ? Shale dk gray to black  
with silt laminar  
Top of local outcrop.

Locality W-12



Part B

Shale dk gray black  
Fall River - Lakota contact

- 2.6 Sandy unvegetated clst, grading  
to ss below. Worth white sandstone  
rocks wet gray - 10' - 13'
- 27.5 Sandstone fine gr to med. gr  
cylindrical white, chert  
+ gl'z cyl<sup>br</sup> in base 4'  
locally

Base of ss is clayey, chert red  
some 1' thick, 10' - 12' but  
observed in 2' but 2' - 3', red  
to purple with green staining  
below to about 10' above next  
ss. Then 15. Gray with  
some greenish green.

From base of R+T's lower ss  
is 12' red clay - 10', upper  
7 is greenish gray dk then  
about 10' red, then gray with  
band black about 0.6 above  
ss. Then ss, hard loc, ± 2.0 ft  
laterally loc. out. Has little  
thin fine gr dk gray to black  
claystone, gray to black 3' - 4'  
Then comes 9'

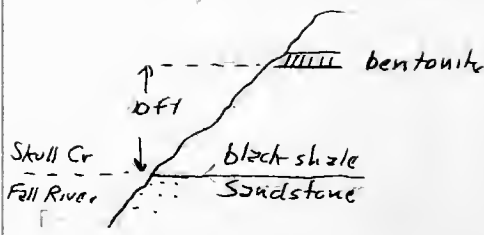
[work given to Palaeontology  
CM-2005]



limestone interval. Consists  
alternating fine ls, + greenish  
gray to gray claystone

Dinosaur bones are due N.  
of barn, 30° NE bridge +  
55' E fence

Route 116 Reconnaissance. - S + E from Creek +  
Weston Co. line. Fall River exposed  
in road cuts and stream. Bluffs  
could possibly piece complete  
section here. Though the bottom  
contact would have to be dug out  
Contact with Skull Creek in  
first road bank W of the last (2nd)  
bridge over Fall River. At the  
bank, the grasses show, black shale



and a hole  
can be dug  
at loc. 106  
higher up,  
10' from  
base.

The lower part of the Skull Creek



fossil loc.  
—

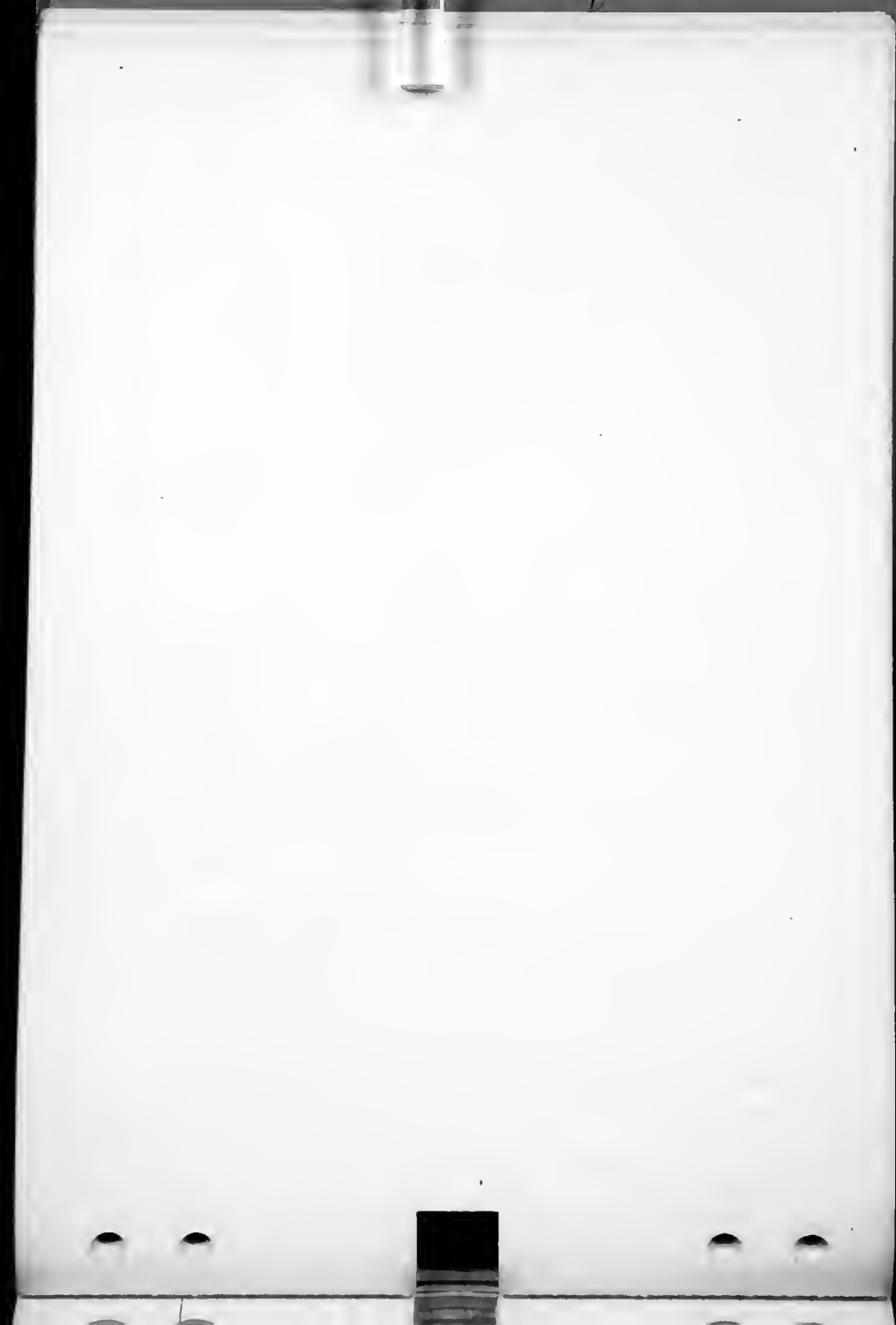
is fairly well-exposed. At some of highest knobs with great creek gulleys is floor of Silts. Fine ss. gray, with Lingulella. No vert. fos. seen at this loc. up. The Lingule ss. is exposed in the last road cut\* to the west, north side, where it consists of irreg. interbedded ss & sh. & loc. silts. over 5' thick. \* (Section here about cut N side rd W. of Massell Creek.)

Locality W-12

Robinson-Mayer - Cabin Cr. Section.

Base up. -

- 10+ Redwater
- 4 sandstone
- 8 claystone (obs)
- 2 limestone
- 18 claystone
- 5 sandstone, calc.
- 55 claystone, sandy zones
- 1 limestone
- 34 claystone, some limestone
- 4 conglomerate
- 105 claystone, 29-34 above base, cgl.  
and above this 7' is another thin one.
- 18 Observed
- 35 Massive calc ss.
- 10 sandy shale
- 4 shale
- 5 sandstone
- 7 sandy sh
- 3 sandstone, limy
- 20 Obs. 18 sandy sh + ss
- 5 sandstone
- 35 18 sandy sh + ss
- 10+ sandstone





COLUMBIA COLLEGE

Part A, ascending down from upper bed which is locally and as ledge up from the base of the Fall River



0.7 Shale, gray above below 14 62.  
below 15 10.5 17

3.5 Shale, thin-gr, loc. silty,  
massive, some gray with  
some yellowish stain, caps  
ledg. in upper part  
below 16 20

7.7 Shale, thin bedded to tabular,  
massive, some silty, some  
some shaly ss layers in  
part in upper 1/2  
to lower 1/2  
below 21 25  
1.5. Lower 2' massive  
fossiliferous & thin. Below 25  
in lower part + shaly to bed  
below 25 27  
below 27 29  
below 29 31

1.9 Fossiliferous, shaly, some  
sand and black shale. Below  
below 31 33

1.9 Shale, hard, silty, gray, with  
abundant plant frags. Fe stain loc. +  
some Fe cones with clay centers. 8



→ Fall River - Late contact

4.3 Claystone, silty, minor clayey siltstone  
top, light gray to speck on fresh  
surface, weathers bright orange-  
yellow, massive, bedded, silty  
downward.

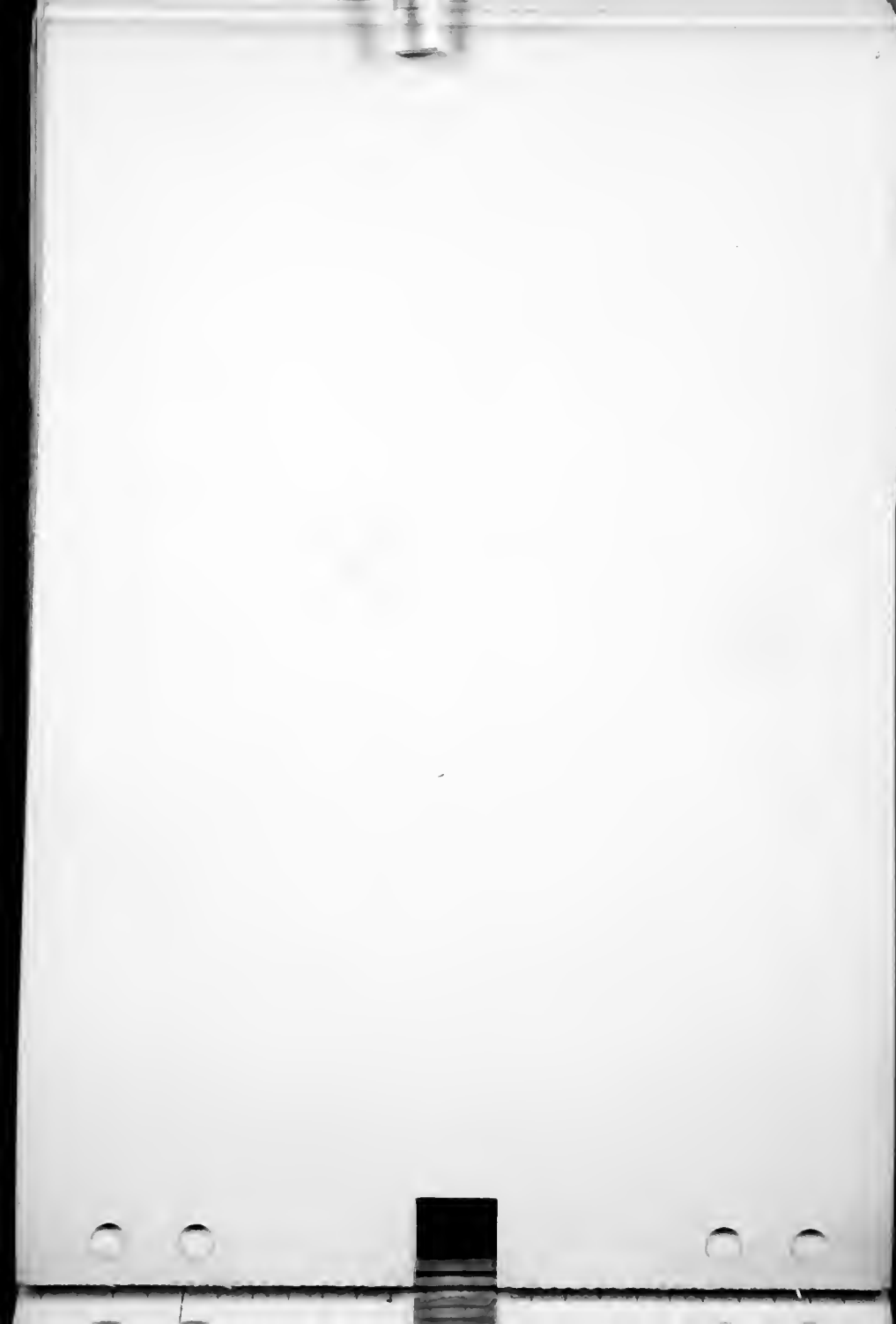
1.0 Claystone, massive, light gray,  
some yellow staining.

1.7 Claystone, to 1.5' below top  
of unit, silty, Fe sp.  
staining, massive, silty  
downward, some Fe  
staining.

2.3 Silty claystone, light gray at top,  
weathers yellow, Fe sp.  
staining, massive, silty  
downward.

2.7 Claystone, light gray, massive,  
weathers yellow, Fe sp.  
staining, massive, silty  
downward.

2.10 Claystone, light gray, massive,  
weathers yellow, Fe sp.  
staining, massive, silty  
downward.



0  
(Offset here to E on to ss. below)

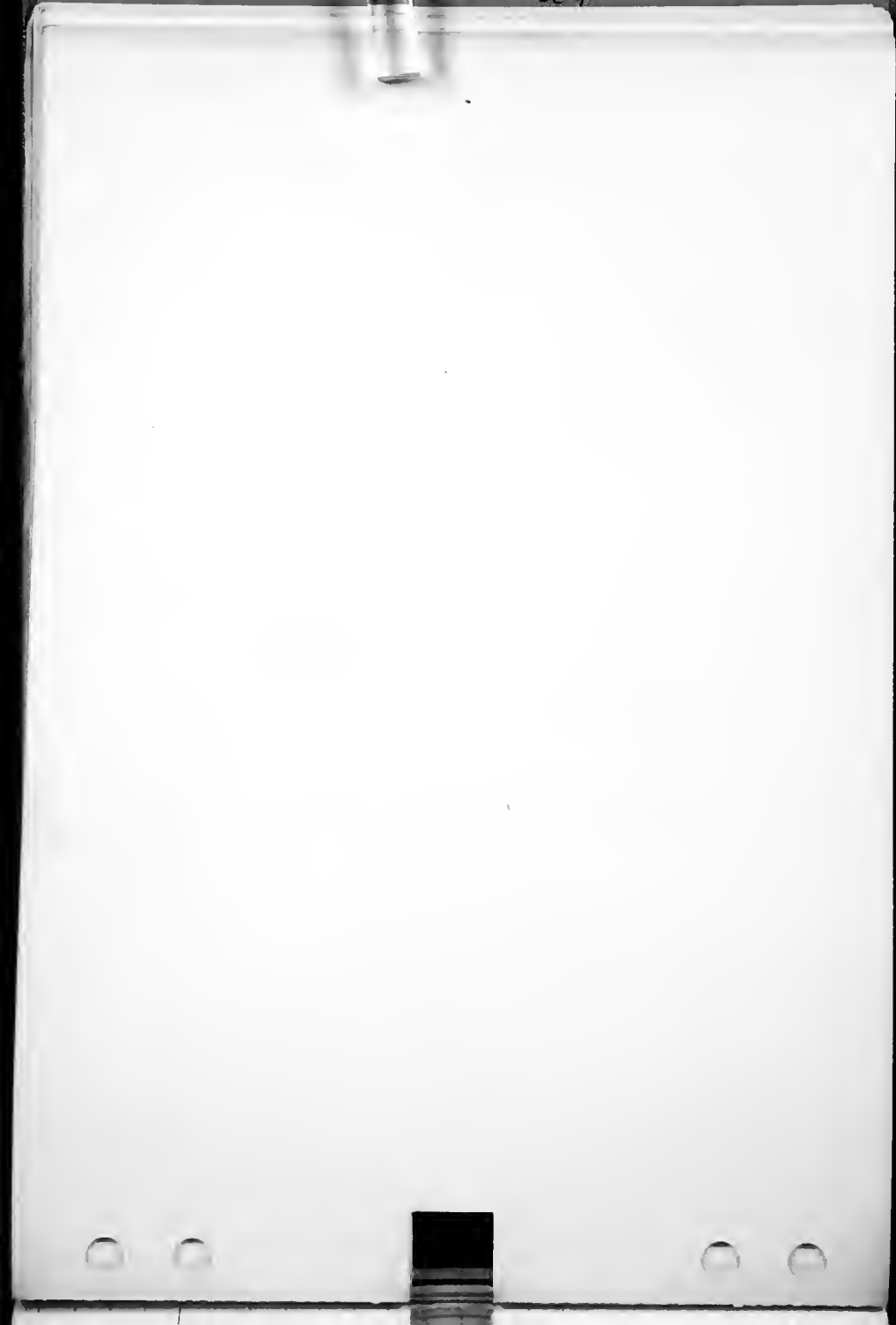
Part B

35.0 Coarse, variable in character  
but cherty, fine-grained gr. with local  
spongers chrt & qtz in basal 5-10 ft.  
Massive to thinly bedded - cross-bedded,  
weathered gray white, yellow stain to red br  
loc. yellow stain. Some inter-  
stratified loc in x-bedded.  
3.6 Coarse, cherty, spongy, & cherty, base of  
ss above in local interbeds.

10.5 3.0 to 4.0 ft. thick, dark gray  
weathered, claystone, dark gray  
at base, thin bedded, cherty  
in upper part, cherty in lower part.  
↓

4.3 Weathered light gray clay-  
stone, thin bedded, cherty  
qtz & chrt in base, cherty  
gray in upper part, cherty in  
lower part.

1.0 Sandstone, clayey, coarse &  
carbonaceous, and sandy  
claystone, gray to green  
green white + yellow. Grains  
& much chrt & qtz & fragments  
(or interbeds) of ss  
in upper part.





2.5 Claystone, gray to dark gray, with  
scattered che granules. Becomes  
sandy in lower part

12.0 Sandstone, med-coarse & calcareous with  
interstitial gray claystone, and  
claystone sandy to calcareous.  
Contains sand with zones  
of clay. Contains small  
pebbles. Color is light  
gray to grayish gray.

2.0 Claystone, light gray, med-  
coarse, scattered grain +  
fine sandstone at top.  
No fossils.

7.9 Sandstone, med-coarse, red, gray,  
gray + purple. Has scattered  
che + a little med-coarse  
granules in bed.

7.0 Sandstone, fine to med, inter-  
calated with claystone + scattered  
small and quartz granules  
Gray, red, purple.

4.0 Claystone, gray green, scattered  
small pebbles in upper  
part.



10.6

Clayside, ch clay red + purple  
red with local green  
mottling. Upper 3' variable  
red + green, below 3'  
red which has scattered  
mottled green + small light  
green. At base of  
green + yellow mottling  
in lower 2'

12.8

Clayside, red + yellow green  
mottling. Section 1' to 2'  
mottled red + green, below  
1' of green 1.5 to 2.5  
above 1'

15.0

Section four med. fine.  
at red clay base. To 5' or  
green + yellow mottling  
above 1' of green + yellow  
ss, with some red + yellow  
clay. To 10' or more. To  
gray, mottled green + yellow  
mottled red. Green + yellow  
green + yellow mottling  
mottled red + green + yellow  
mottled red. At base of  
clay bed or 3' at which  
clay is very fine. To 15'



6.7

Sandstone, as above, with some sandy claystone in upper 2 ft, fine to med. clay to shaly clay ss below with progressive more & more sand & qtz granules in lower. Basal 0.4 to 1' fine, indurated, calcareous, is coarse, calc ss, calcareous.

2.3

Sandstone, clayey (calc.), and calc ss in claystone. Gray, weathering gray, white. Sandstone with qtz granules. Zone sandstone calc is coarse 1' from top and a layer such calc is at base, weathering brown & calc, is coarse to fine, (Sample 1)

9.9

Sandstone, as above, sandstone, indurated layers, sandstone, calcareous, (1) clay. Calc. 2 or 3 coarse sandstone, sandy to calc. is coarse and several calc zones, including indurated basal



all caliche stuff chert + qtz in  
granule to small pebble size  
Basal cal + thickens section  
to 3.5, <sup>upper 1.5 is</sup> is brown weath.  
+ lower has zone of  
carbonized plant frags.

6.1  
Claystone + sandy + clay.  
Sandy clay. Few sections  
chert + chert granules.  
All red. Gray to  
dark gray in middle  
part. Harder gray  
lower part.

Point C. - Upper section of the  
claystone + up from the claystone  
to the claystone + up from the claystone  
to the claystone + up from the claystone  
to the claystone + up from the claystone

In the claystone + up from the claystone  
to the claystone + up from the claystone  
this only top of it - or within it

24.5 Claystone + up from the claystone  
to the claystone + up from the claystone

2.5 Claystone + up from the claystone  
to the claystone + up from the claystone





66.0 Claystone, brown, silty, with  
 pebbles - to 1/4 in lower 26.  
 feet, with some red beds.  
 Upper 40 feet is a yellowish  
 red, micaceous, silty clay. There  
 is red sand has numerous small  
 pebbles, like sand, 3/16 to 1/4 in  
 diameter & some 1/2 septaria

14.5

15.0

Claystone, gray, micaceous  
 with some gray calc.  
 6' to 8' thick, with  
 some thin red beds  
 with thin red beds  
 1/2 in. to 2 in. thick  
 with some thin red  
 beds 1/2 in. to 2 in. thick

8' to 10'

6' to 8' Claystone, silty, fine grained, B

6'

5.7 feet of claystone, silty, fine grained, B







W-14

Sturgis section

Part A  
(Upper Relict)

23.0 sandstone, massive cross-bedded, to  
irreg thin-bedded + cross bedded,  
fine-med gr. Weathered brown.  
carb frags.

4.0 Interbedded, siltstone, shale  
and sandstone. Upper 1.3 is  
white, weath. sandy siltst.  
with local thin beds sandstone.  
Then 0.7 - 1.0 of gray shale with  
carb fragments. basal 2.0 is  
silty white to grayish to ss,  
changing massive and at base  
where it becomes platy and  
grades into sh below.

3.0 Sandstone, thin bedded, fine gr,  
locally has 1.0 of ss. 1.0 at  
top, weath. gray br to CR.  
Fossils small, frag. Lower  
1.0 has interbeds of gray  
silty sh + siltst. Sand frags

0.0 Siltstone gray, loc. shaly, soft



2.9

Siltstone, thin bedded, finely  
laminated, gray to light gray  
Locally some thin beds fine gr  
silty ss intercalated. Dk gray  
laminar and shaly have carb  
matter, weathers gray

1.5

Siltstone, brown, dk + light as  
above, plant fragments, loc  
sandy; diff. from above  
in being more massive -  
bedded. Plant remains less  
(in next not clear this is fig. ss likely)

1.9

Siltstone, massive in lower  
part, somewhat shaly in  
upper. Dk gray to black  
locally carbonaceous. locally

= 0.9 Silty gray siltst.  
carb frags, crumbly

0.6 Hard dk gray-bk  
siltstone, bluish  
+ fuzzy

0.4 As above but - crumbly,  
locally somewhat clay

Full River - Lakota contact.

(Page 2)

4.6

Siltstone, gray, ferruginous, with  
Fe specks, weathers bright orange-  
yellow, grading down and  
then silty claystone to





gray claystone. Crop weathers  
yellow & white. Upper foot  
of siltstone heavily stained  
with Fe con. extracted in  
thin layers. Locally hard  
siltstone lenses occur  
in this upper ft. Ave  
massive, vertical fract.

8.3

Claystone, siltstone, gray  
with black, brown, red, yellow  
& brown. Has to sp. s. Loc.  
silty zones, and thin  
siltstone <sup>near base</sup> siltstone. Some  
conc. Fe in black.

8.0+

covered at base to top  
massive w of red

Part C

Top of bed w of red between  
exposed at base of bed &  
exposed in massive. Locally  
down hill.

6.0: Interbedded w. gray  
with red siltstone  
and thin gr. sandstone  
in 200' part ss in  
bed to 1.0: Upper 2.5



chiefly platy thin ss and  
siltstone.

Rests on massive ss unit  
below and occupies lower  
6' of 8' observed interval  
base at Part B.

Part D.

Big tabular ss in E side  
roadcut.

c 62.0+

Ss stone massive siltstone  
brown 22-25 feet above base  
separates a lower coarse-grained  
loc. cyltr ss from upper  
medium-grained. About 0.2 of  
lighter color, claystone &  
breccia, greenish east side of road.  
Upper part has a few thin  
silt & siltstone. Partings of thin  
massive bedding. Darker at top than  
brown, siltstone - ss in upper  
part.

inter - K. ridge.

B 219

Claystone, frequent, gray  
to light gray. Upper 0.6 to  
1.0 is hard loc. - wry silt  
and clay - large logs.  
(Sample 1 = spec fossil wood)  
(Sample 2 = frag claystone)



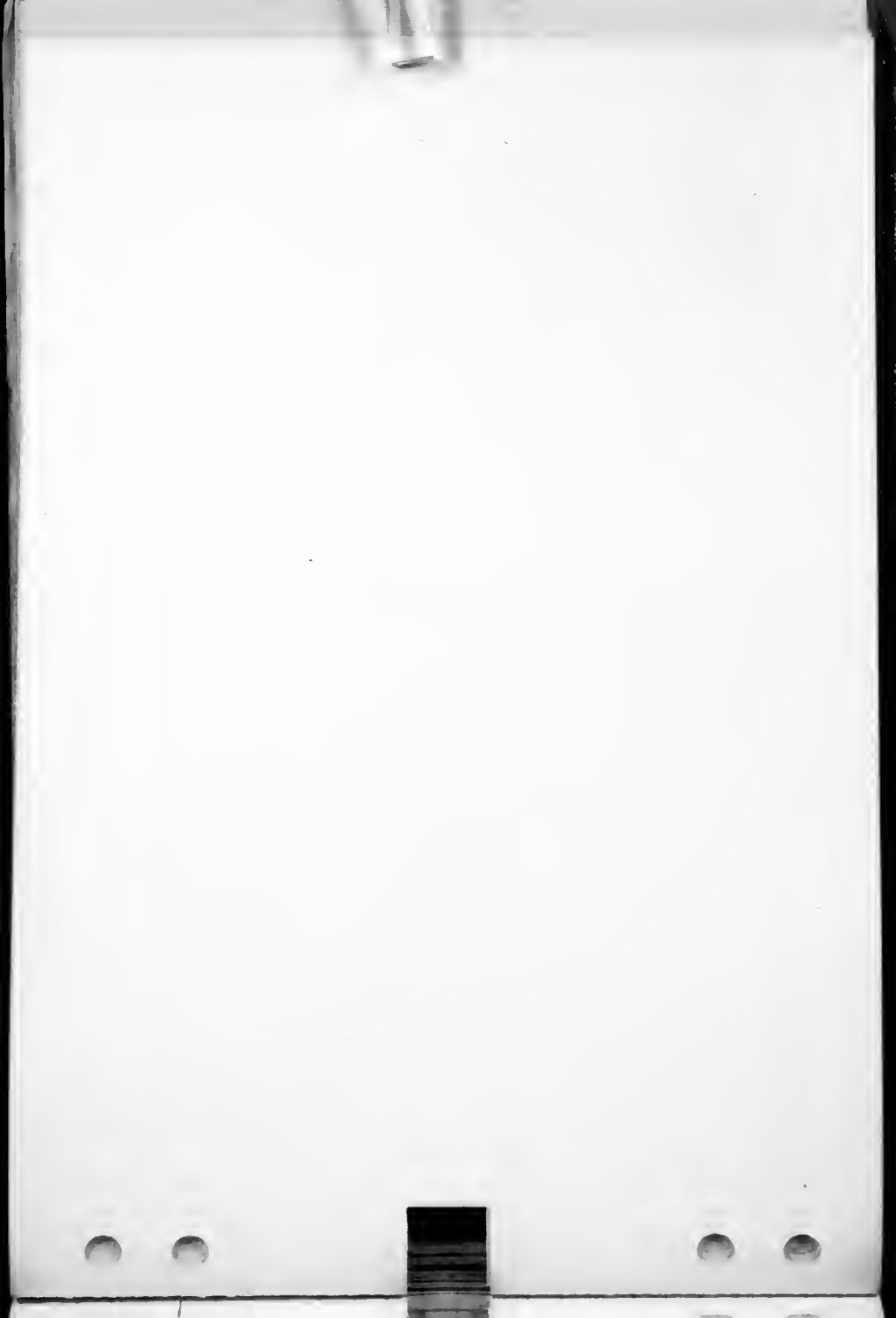
Beneath logs claystone softer and  
not generally silty. Has  
local coaly partings.

- A 13.0-? Claystone, dark gray to black  
silty, with intervals  
of fine gr. l. or f. or  
stained (O) ss up to 0.6 thick.  
Some intervals are lenticular  
do not hold constant position  
in outcrop face. Lower limit  
of interval exposed also  
shows some interlamination  
of ss. This is very a trans-  
verse thin lens.

Slope down and slump

- Part E At the bottom of column 6 is 7'± of  
unit which shows a greenish  
gray to black, very silty, mottled  
sand. Thickness of interval A of  
part D estimated at 27.0± on basis  
of correlation of zone 20 to  
part E. This interval is about  
5' thick.

Base of Unit A, Pt D. measuring down  
22.7 Sandstone, medium gr., unconsolidated,  
with intervals green gray. 21



up to 0.6, chiefly in lower half.  
Some thin clayey ss, much  
weathers light gray, yellow cast,  
some to yellow & even stain.





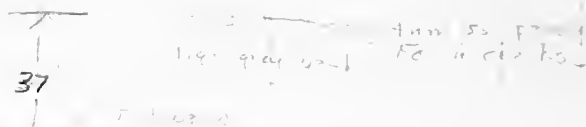
5.0 ± Variable zone of med. ss units.  
 Darker in color. Coarser & rougher  
 zone, made up of coarse cgl,  
 sandstone, cgl + qtz + pellets,  
 Med gr ss lenses, cgl + claystone  
 with ss pebbles & cgl, and  
 throughout many rounded pebbles  
 & pebbles of cgl + sandy cgl.  
 Locally, however, of unit above  
 cuts it out. Best exposed at  
 end cut where it is hard to see.  
 Sandstone cgl in soft ss matrix  
 with moderate to coarse cgl  
 + qtz pebbles. Cgl + ss. Locally  
 some better cgl + ss matrix  
 is in frequency.

Polished pebbles found  
 in place scattered sporadically  
 through this zone.

11.0 ± Sandstone, med. coarse, cgl  
 + cgl, med coarse, cgl  
 at top with some cgl + qtz  
 cgl + qtz. Med coarse cgl + qtz  
 frags and some cgl + qtz  
 grains + granules throughout  
 mostly built to bulk  
 Base of cut.

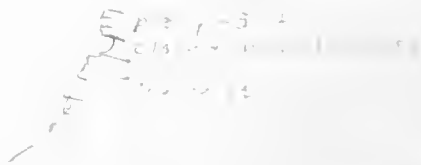


Just to NE of cut Pt. A. Slop.  
 a to be in the ss. ss. ss. ss.  
 From top of ss head up, up.



← This is the same as the one  
 under it. The ss. are red and  
 and with a interval to ss  
 at base of pt. A.

NE of cut just in red ss. ss. ss. ss.  
 cut up, 1000 ft. ss. ss. ss. ss.  
 1000 ft. ss. ss. ss. ss. ss. ss. ss. ss. ss.



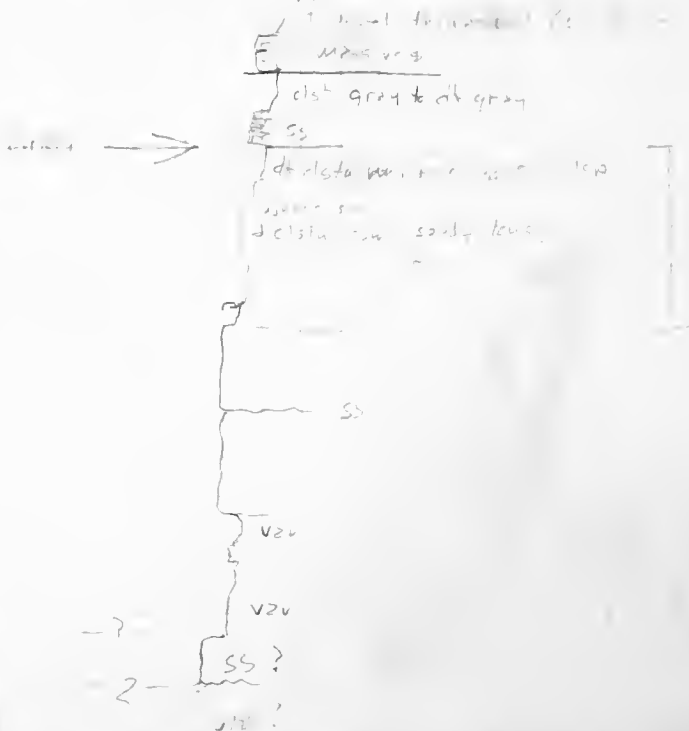
From pt. A. ss. head up, it is 77  
 feet to base of ss. ss. ss. ss.  
 1000 ft. ss. ss. ss. ss. ss. ss. ss. ss. ss.



light gray sandstone, but upper  
10'± dk gray; with red variegated  
zone at top.

Sandstone capping this thickness  
not as good 6-? massive, brown  
weather. Above is more claystone  
to F<sub>2</sub> R<sub>2</sub> contact, which is  
exposed just S of dinosaur  
statues.

Approx section Lakota -





W-16

Rapid City route 16 sec. 16.

Starting in base yellow S. of US 16  
just sw. of p. 1.

9.-? Sandstone, massive, fine to  
medium grained, tabular & lath  
weathered brown.

5.5 Partly observed, upper 2-3 feet  
medium gr. sandstone, clay  
sandy & lath, - + - in on top.  
Some gyp in upper thickness, with  
locally less brown stain

4.2 claystone, gray, silty to sandy

24.7 claystone, gray, silty, loc. clay-  
stone, var. red, brown  
and yellow, upper 3.0 is  
stained yellow & orange, is  
lighter gray, weathered white  
with yellow & orange stain.  
Fe specs pepper entire  
variegated zone. & some  
in number. claystone.





1.31 Sandstone, massive, fine gr.  
buff weath. loc. silty, carb  
particles

1.3 Silty sh., gray, massive

11.4 Interbedded gray to dk. sh. shale  
and silty shale, and thin beds  
of ss + stone. and fine grained ss.  
top 3.0 cherty, black, blocky  
shale with some silty  
in lower part, weathering  
2.5 Siltstone, even bedded,  
few ss layers, locally  
sandy at top forms  
ledge locally. weathering  
5.9 Interbedded gray to  
dk gr + silty sh +  
clay + thin beds  
fine grained sandstone  
+ silty sh., some  
Fe brown staining,  
weath. gray green

1.9 Siltstone, clayey, massive, gray,  
carb flecks. thin beds of gray  
shaly siltst. carb. thin in upper  
part. Grades to units above +  
below.



P 2.0 Sandstone, thin-bedded, wavy, gray, weathers buff to yellowish, gray, forms platy ledge for many with base evenly 18.5 where latter is massive. Occasional

C 20.0+ Interbedded siltstone and fine grained sandstone, laminated, thin bedded, weathers brownish. A variable unit which goes better both to sandy siltstone with thin sand and to sandstone, ss, though latter mostly in upper 10' while lower part sandstone, relatively soft & silty.

P 5.0 Sandstone, shaly, gray, some thin lenses, sandstone & silty, siltstone <sup>cherty</sup> in basal 2 feet.

A 4.6 Sandstone in massive beds, laminated to x-lam with some thin interbedded shaly gray siltstone. Laterally this channel sand unit lenses out into shaly siltst. (see part B) but to W it appears to thicken to local massive ss 15' or more



thick.

Part B

From top unit C Part A  
measuring up the gully about  
50' to N of Part A.

D 5.3 Siltstone, shaly, micaceous  
shale. Some thin beds fine gr  
ss in basal 2 ft, and  
upper 1.5.

C 7.3 Siltstone or below with  
thin interbedded laminated  
fine-gr. sandstone which  
contains Fe impreg +  
weathers OB. Unit weathers  
yellow gray.

11.0 Siltstone, shaly, greenish  
lens 9' to 10' in massive  
in upper 2, weathers yellow  
gray some yellow-orange  
stain.

A 210± Fe impreg sandstone ledge.

Unit C 75± to N,  
start on base ss ledge  
correlative with 210 ledge  
for part.



B

12.8'

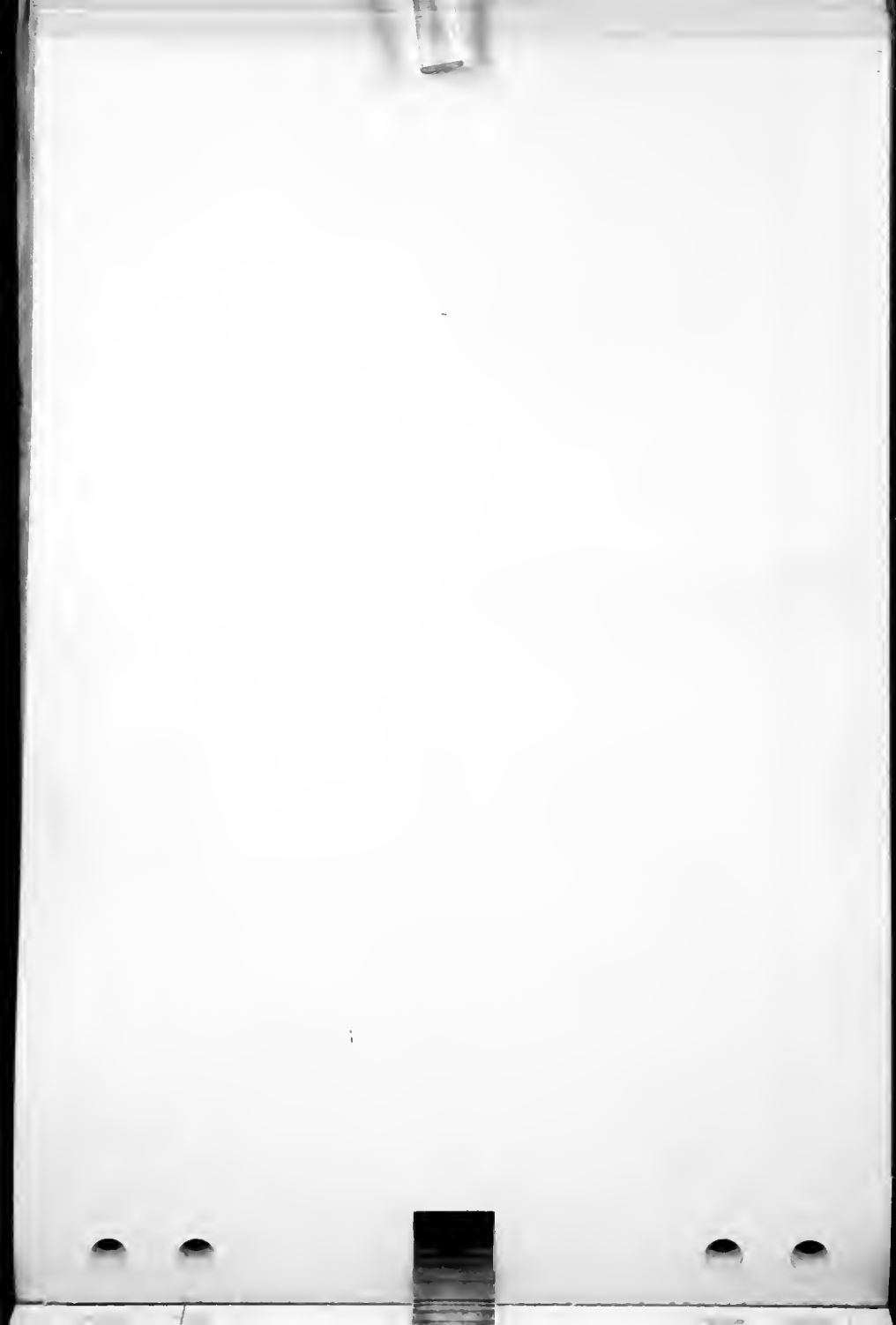
Sandstone, chiefly fine gr.  
thin bedded, with interbeds  
gray to dark gray shaly siltst  
ss is 12m. to 18-20m. has  
Fe imping. layers locally,  
commonly at base.  
and where thin sand  
layers + the shaly siltst.  
Laterally ss thins + the shaly  
chert + sandy slope to a river.

A

3.0

Siltstone, shaly, gray to dk  
gray, thin bedded, thin, at  
fine gr ss. Laterally chert  
+ roots

Section of U.S. 16 shows variation at  
A. The unit in part B, with the 15  
ss. is at base and thin  
to ss. Locally, however, lateral  
thinning is evident. The thin  
Fall River unit is also of ss. chert.  
The part B in road cut is  
with sandstone, mostly siltst.  
with some ss. has X-bedding  
Fe imping. ss. and is capped by  
a shale with carb. nodules, and  
a thin chert layer. The  
contact. No Fe spots in beds below  
this contact.





## W-17 Fuson Canyon

Part A Handleveling up type, from top  
sandstone beginning pt. B.

4.5± Wash covered slope + feet  
of red + yellow clstn in  
upper part.

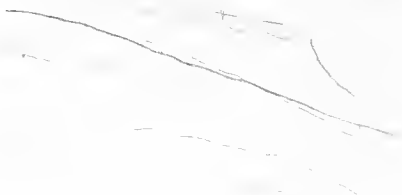
5.0± ~~covered to base of~~ ~~ss of next unit,~~

6.5± Sandstone, fine gr., lam. texture  
rip marks with rip laminae  
weathering to odd bedding  
patterns. Interbedded shaly ss.  
micaceous. Has covered interval  
near top.

4.0± Sandstone continuous with  
below but massive & laminar  
to irregular tabular. Med gr.  
mic. weathers light grey.

18.0± Covered to base of ss cap,  
dip slope (~~covered~~ ~~unit~~)

5. 1



37.- 2 Sandstone, massive, x-lam.  
locally, to coarse x lam. and  
fine to med OB to red brown  
some block. Greenish gray  
jointing weathers to  
Jagged ledge, fine-med. gr.

Gravel wash on dip slope of crest

Part B Sand was measuring down from  
ss at base part A.

160 Sandstone massive x-lam  
to lam. bed & lenses ± 1 ft  
thick with some interbeds  
shaly siltstone. Top bed  
is 2' thick. Locally soft.  
Loc upwind & down treched.  
Grades to underlying unit.  
Fine gr. med, calcareous.

Part C Wind canyon, face showing  
numerous ss beds

This is the "type" of Dexten.

At this locality the "Fuson"  
has thin ss right up to base  
massive "Dakota", from base  
of platy ledge Part B. Contact  
prob at base ss. All stuff  
exposed beneath platy ss is



gray clay w/ red mottling  
+ yellow stain.

Section starts at top massive ss  
ledge, part of which prob.  
include about 12' section B  
as only 4' of interbedded ss  
on top this ledge till very clayey

49. ~~Section~~ med. gr, massive  
x-lam becoming tabular x-lam  
in upper part. Weathers brown  
to OB. Basal 10' obs. may be  
same.

4.2 Coarse to conglomeratic ss.  
cht + qtzt grains + granules  
clastic very coarse ss,  
few granules.

24.4 Sandstone, fine gr, silty sand  
siltstone. Massive ledge locally  
10' at 1' interval from 4' below  
top. Has 0.7 Fe stone cap.  
Lower x-lam has ss beds in  
FeOB. Middle 6 to 10' chiefly  
massive fine gr ss, basal  
4.0' has interbeds gray  
shaly siltst.

200' 200' 40'



- 26.0' Sandstone, coarse & fine gr.  
 + 0.2-0.4' Fe stone cap and another  
 red ferruginous band 3 to 4' from top  
 Lower 6' coarse gr. <sup>fine</sup> coarse gr.  
 brown & gray weathers white  
 silty clay. Basal 1-2' Fe  
 impreg, locally conc.
- 15.0' Clay and silt, + clay, silty  
 gray weath. yellow at top to  
 white weath. silt. cov, harder  
 at base, grades to clay below
- 10 to 10.6' Hard white siltstone  
 and sandy siltstone. Upper 6'  
 white <sup>purple mottling</sup> ~~massive~~ lower 4' purple  
 Mottled or spotted loc. local frag  
 mental zones, some char. loc.  
 at top. W.P. parts loc sep by yellow <sup>clay</sup>
- 9.8' Siltstone, and silty claystone  
 chiefly with subconc  
 fragments, local massive  
 silty beds, purplish red  
 Fe brown stains near base
- 6.5' Siltstone, massive, few  
 clayey ptngs, weathers gray  
 purple some yellow stain  
 Fe banded concs at top
- Shale... wash





W-18

Cerile quad. Morrison section  
SW of W-13. Carbon section.

Going up

10.0 - 10.5 Dk gray fossil sh.  
some at top with white wet  
fossiliferous ls. color  
about 5' from top

12.5 Sandstone, fine gr. gray  
x-laminated below at base  
grades to silty clay  
becoming yellow, especially  
at top. Silty clay  
yellowish with some  
fossiliferous thin bedded sh.  
yellowish silty clay with  
interbedded fine bedded  
12.0 - 12.5 yellow gray yellow &  
cherty shaly gray laminated  
sh. 5' or less at top is  
0.3 or less calc. sh.

4.6 Interbedded sh. & ls. with some  
fossiliferous thin bedded sh.  
above is calcareous. It has  
some thin bedded  
and this continues to have



thin, sandy, limestone, 0.8 from top.  
Above this it is a gray  
calc. claystone.

1.0± Limestone, massive, epitaxial.  
light gray, weathers gray  
white sand brown stain

8.4 Claystone, <sup>var.</sup> gray to blackish  
gray and red, silty calc.  
Thin limestone in lower  
bed part of unit, about 2/10 from  
base. At top is a 1/2' of  
light gray green silty, platy  
limestone and thin ss.  
Weathers light green, brown  
X-lam, loc. has rhy. marks.

10.8 Claystone, <sup>var.</sup> red to green  
red to green

2.8 Sandstone, calcareous, to  
sandy limestone, thin.  
113 loc. sandy limestone, calc  
slightly to fine ss. Upper  
part of unit massive,  
silty to very thin  
bedded ss + calc. calc  
ss. Including patches  
coarse ss grains in lower 37



chert & quartz granules, bone  
 fragments, shell, iron and  
 clay pellets; Weathers  
 brown but has light  
 grey green color on river  
 banks. Some fine  
 nodules, has green grey,  
 some brown, some light  
 green, some red, some  
 blue, some white, all found in  
 the same place.

12

Silty, sandy, clay, some  
 nodules, silty, some  
 light green, light grey,  
 grey, green, some brown,  
 some white, some red.

14.6

Claystone, calcareous, light  
 grey, some green, some  
 brown, some white, some  
 from 3.2 to 10 ft from  
 base.

4.6

Claystone, calcareous,  
 light grey, some green, some  
 brown, some white, some  
 from 3.2 to 10 ft from  
 base.



- 4.5 Claystone, red + yellow var. calcareous
- 2.5 Nodular limestone in green grey calc. claystone, local forms crumbly break in base slope. Some reddish red in upper + lower parts, gradational above + below the lime nod. Limestone sharp upper to unit above
- 5.6 Claystone calcareous, varying red, with 1.5 green calc. claystone containing limestone nodules at top.
- 2.2 Claystone, calc., chert - red, some yellow + gray nodules
- 5.8 Claystone calc., <sup>and</sup> ~~interbedded~~ <sup>interbedded</sup> limestone <sup>3.1</sup> ~~chert~~ <sup>gray</sup> ~~beds~~ <sup>beds</sup> ~~lower~~ <sup>lower</sup> green, some red nodules in lower 2.0. 2nd light green in upper 1.5. Continuous with unit above





- 7.0 Claystone, noncalcareous,  
var gray, dark <sup>purple</sup> gray & green  
gray. Upper 20' light gray  
green, calcareous, cherty.  
dk purple gray, some thin,  
some green with mag at base
- 5.3 Claystone, noncalcareous,  
gray to dark gray.
- 4.3 Covered zone, west of site  
cyl at base.
- 48.0 Sandstone with to 10% silt  
with lam. at top & at  
base. cyl in lower 20'  
upper 8'-10', mostly fine  
some what silty, very  
thin bedded & bed. Lower 4' to  
base are x-bedded & silty or  
ss & red.  
At top, or up 2', becomes  
silty & green. Also 2' or more  
gray white siltstone which  
in turn goes into a silty  
claystone. The siltstone caps  
brown back from point where  
section was measured.
- From my notes back to N. Jones







Northeastern Carlile Quad. with Max Bergendahl and  
Bob Davis.

Fall River - here consistently 3 sandstone  
units with dk gray shale interval  
between #1 and #2, ascending. #1 is  
thin bedded chiefly, rarely becomes  
massive. Distance above contact with  
Fuson-Lahote varies. Shale between it  
and #2 dk gray with selenite. No  
obvious thin ss beds + Max didn't  
mention any. #2 is the most  
prominent, most consistently massive  
tho it may have thin-bedded parts.  
Max pointed out calcareous, round,  
concretions in it, formed by  $\text{CaCO}_3$   
impreg. in spherical form. Also  
some thin lenses  $\text{CaCO}_3$  sandstone  
in base, -convex downward where I  
saw them. Max has found no cgl  
in the Fall River, consistently ~~th~~  
fine-grained, commonly micaceous.  
#3 sand separated by only a  
few feet sandy shale from #2,  
is more commonly thin bedded but  
locally it too gets massive - may  
locally coalesce with #2. Top  
seems consistently platy. Overlain  
by good Skull Creek sh.



Fall River - Lakota contact. Seen at A, B, D, and the Carlile Mine road cut. At B, considerable,  $\pm 15'$  shale between change to Fe speckled var. clstn and the 1st Fall River ss. At A, a thin grey ss with plant frags is at base Fall River & sits on light grey clayey silts. Then comes var. zone. At D, a good break from grey, carb speckled, silty clstn to light grey then var. yell. & red. Fe speckled clstn. At the Carlile Mine the contact zone very atypical and good break in lith. not evident. Here there is much carb. matter, including liq. sh. in the interval between the 1st Fall River ss and highest Lakota. Should get section of this.

Fuson-Lakota unit: In this area the

Lakota is consistently sandy & cglte. A lower massive cglte ss is commonly a cliff former but passes locally, in part, into unconsol. gravelly sand. Above it is locally (viz Black Gulch & Carlile mine) a clstn interval with some ss layers, then an upper massive ss. (letter ~~F~~ -





carries the uranium at the Carlile Mine) Locally one of the sands in the clstn interval thickens and it joins those above and below to form a single unit of sandstone est. by Max and Bob to be at least 150 to 165 ft. locally. This happens in Black Gulch, lower half in the SE  $\frac{1}{4}$  sec. 34, T52N, R. 66W. Also is clstn zone above ~~Top~~ Lakota ss but not certain how much.

Unconsolidated clayey + sandy gravels common feature of Lakota in this area, and they contain polished pebbles as elsewhere. The top ss is above these, the lower, larger ss is both below and at least in part equiv. to them. Locally lower ss has brecc with soft beds - usually fairly coarse or gravelly (See Loc. A for good section of coarse lower beds - and on up into Fall River but top ss small or absent)

Most unusual feature is the constancy of thick cglite sandst. in this area. Cgl at very base typified by abundance black chert pebbles.



Lakota-Morrison contact. - As in other nearby sections the basal Morrison cgl locally sits on dark gray, non-calc. claystone which grades downward into calc. green + red var. calc. claystone without the slightest sign of a break in sedimentation. This change studied closely at W-18 (secp. 36 this nbt), where the calc-noncalc change takes place in an inch of greenish gray + gray claystone. Some banding of alt. green + gray is present but both occur on either side of change so that the color break between green (or var red + green) + gray does not correspond to the change from calc to noncalc.

Consequently in this area 3 choices for placing this contact. 1) at calc-noncalc break [See the cglite ls + calc claystone in W-13 cabin creek to illustrate worthlessness of this criterion] 2) at color change in claystone [illogical on grounds that it is obviously a gradation + that Morrison elsewhere has gray + dk gray claystone in it] 3) at base massive cglite ss. [only logical break locally 45



but here again can be shown that  
this ss goes out completely to SE. -  
see W-12 - leaving no obvious basis  
for similar separation in other  
areas.

Advised Max to lump Fuson + Lakota,  
put Morrison contact at base of  
his massive Lrk. cgl. ss. His #1  
Fall River is near enough to contact  
just below to serve as base in  
mapping.



W-19 Cambrian sections

A. Camp Creek.

Starting base rock ss over caved  
adit E of cv.

- 1.2 Sandstone, med gr, massive  
weathers O.B.
- 0.5 Lignite shale, weathers blue  
gray.
- 0.1 Shale, brn. brown gray,  
weathers white, probably  
porcellanite, plant fossils
- 0.7 Lignite, impure shaly
- 4.3 Sandstone, thick bed,  
med-gr. friable sandy  
ss weath buff + yellow  
gray
- 0.6 Lignite shale +/or lignite
- 8.5 Sandstone fine gr, massive  
x-lam. weathrs gray white  
with yellow staining.

21.  
2.  
18.5



0.4<sup>±</sup> Lignitic sh. & lignite.

18.3 Sandstone, tabular, x lam.  
locally massive, fine  
to med gr, top stained dk  
brown with trails. Weath.  
yellow-gray to CB.

1.1 Sandstone, shaly, fine gr.  
lam. dk gray with many  
plant frags

1.8 Siltstone, massive, light  
gray weathers white  
yellow stain

2.1 Siltstone and sandy siltstone  
friable, percolation observed,

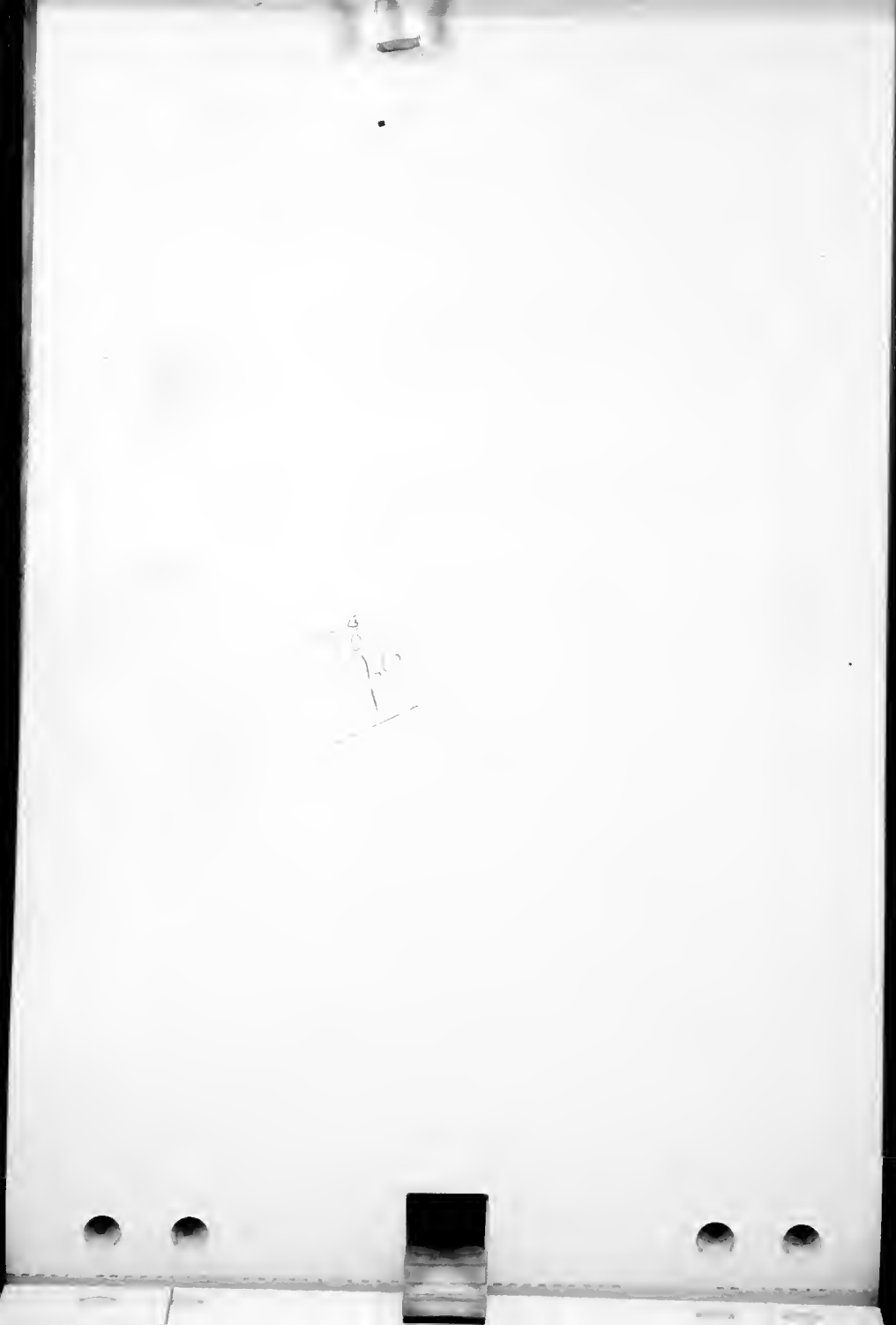
2.2 Quartzite, very fine grained  
massive, vertical, gray  
weathers CB stain

Sam-  
bar

200 ft N.

2.5 Quartzite - see above

3.0 Sandstone, fine gr, massive



in thick beds structures are  
hard, continuous with  
quartzite below and locally  
qtzitic weathers yellow gray

1.7 Claystone, black - dk gray)  
sandy, locally more of a  
shale, weathers light brownish  
gray.

52.0 Sandstone, tabular x lam,  
to massive x-lam med to  
coarse & fairly cglitic  
weathers gray & gray white  
with yellow stain. Coarsest  
cgl fragments in mid-l. part.  
Isolated polished pebble  
2 1/2" long diam. found in  
coarse ss 26' from base.  
Goes to med + fine with  
local coarse zones to  
upper 6'. Contact with  
ledge above shows  
some interbedding of  
ss types, locally some  
platy ss just at or  
under contact.  
More polished pebbles at  
contact with ss above



41.0± Sandstone, med. to coarse-grained with foot<sup>st</sup> very coarse to cglite ss. at base. Forms massive ledge vertical face.

5.0± Partially obscured. At base is 1'± platy micaceous <sup>shale</sup> siltstone & shale, weathers white, grades up into light gray, white weath clstn. Gets platy ss in upper part.

49.0± Sandstone, med gr, tabular & lam, forms shelving upper slope above cliff. former below but here to join, lower one on cliff face. weathers both to yellow gray.

26.0 Well covered interval, some dark gray white & some red wash in lower part

31.8 Sandstone tabular & lam to massive, yellow gray. Some red, med gr.



Top of flat on divide

Neither the Fall River nor Morrissey contacts can be distinguished with certainty at this locality. The section definitely begins above the Morrissey, but the interval under the upper 31.8 ss may include Fall River contact, or may be in Leboz. Need more sections in Cambrian area to tie in.





W-20

Newcastle sections

A- U.S. 85 roadcut thru Mowry + Newcastle  
beginning in Mowry.

5.9 Sandstone, fine-gr, hard, in thick  
massive beds. Weathers yellow  
gray to brown.

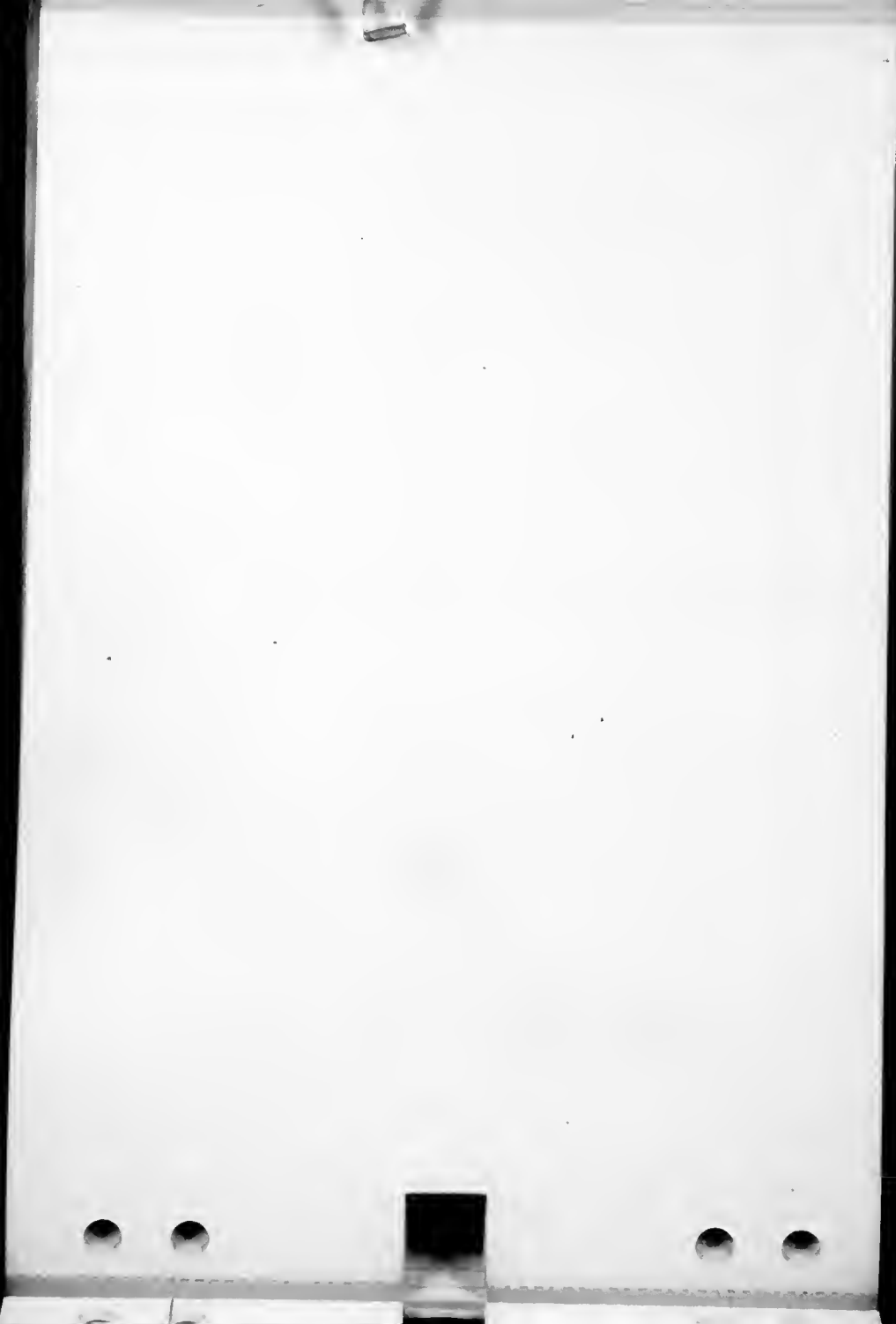
1.5 Siltstone with interbeds silty  
shale and local lenticular  
beds of fine gr. ss. Siltst  
is laminated has thin ss  
beds loc., becomes shaly  
downward, lower 0.5'  
is clayey gray silty shale  
silt + fine ss.

1.3 Shale, gray, silty, intercalous  
common lamination + thin  
beds silt. (Sample 1)

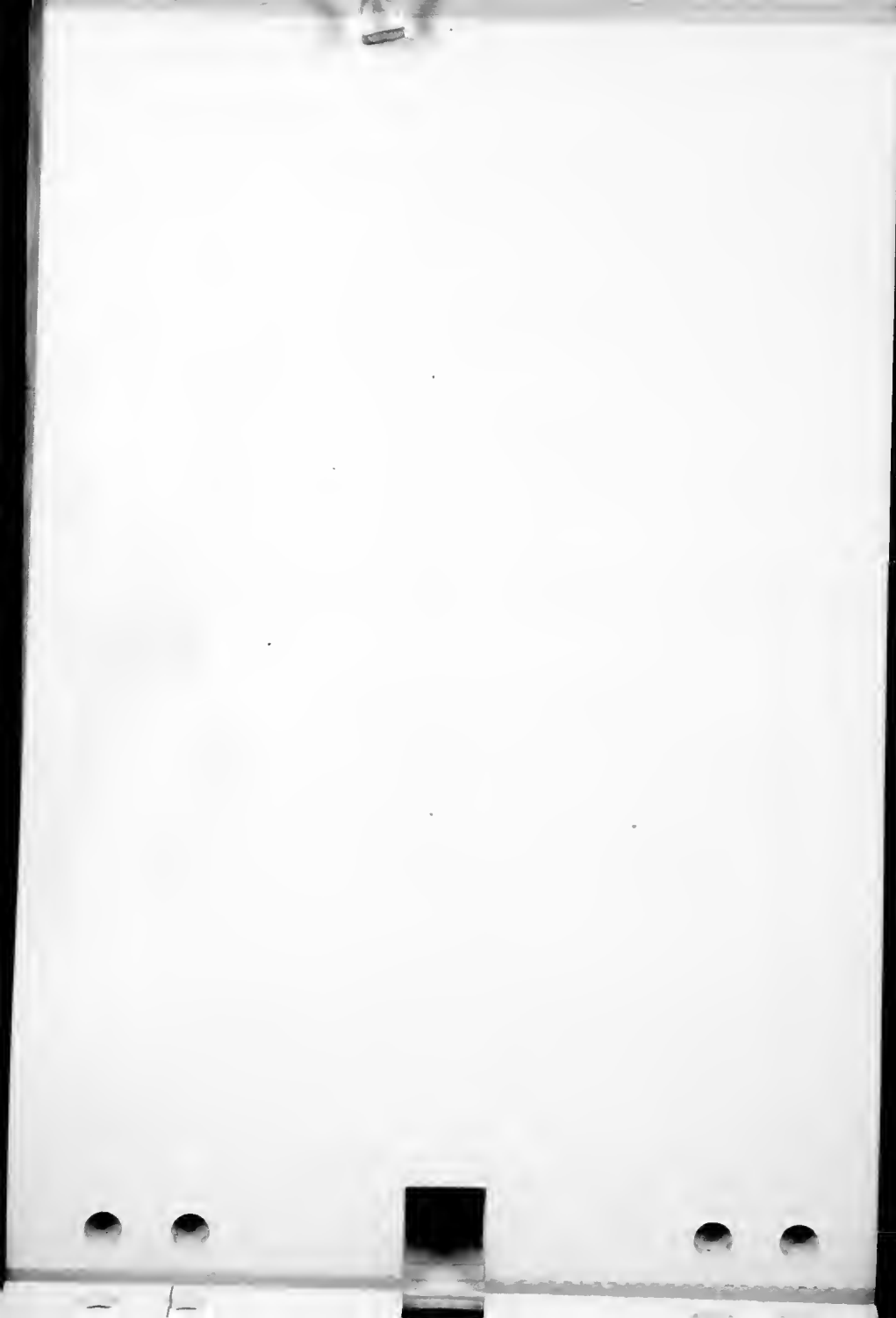
6.9 Bentonite +/- bentonitic sh.  
light green at top, gray green  
to blue green in lower 5',  
some blue gray, light.  
(Sample 2)



- 1.4 Shale, black, carbonaceous, silty, locally grading to carb silty siltstone.
- 1.0 Sandstone, fine grained, loc. silty, and siltstone, gray to light gray, irreg. bedded, weath. light brownish gray some Fe brown on bedding surfaces. Has scat carb frags.
- 4.8 Irreg. massive and dk gray to black silty shale, siltstone and some light gray fine gr ss carb frags thin and thruout. Shaly siltstone is dominant. Lower 1' is a light gray shaly siltst.
- 5.6 Sandstone, fine gr, tabular here, in beds 0.4 to 2.0 with some shaly siltstone partings showing worm tracks & dinosaur foot prints.
- 0.8 Shaly dk gray silty, interbedded and finely interbedded with siltstone.



- 0.6 Claystone, gray, with 0.1 to 0.2 white porcellanite at base.
- 1.7-3.5 Shale, black, carbonaceous becoming silty at base. Thickens up dip at expense of ss below and thin porcellanite comes in 1.7 from base, beneath it dk gray siltst. grading to gray.
- 5.5-3.0 Sandstone, tan to yellow to yellow x-lam, hard, weathers to gray
- 2.8 Claystone, light gray, finely silty, blocky to splintery fracture, (sample 5)
- 15.5 Sandstone. Fine gr, in irreg lenses, loc lam. to irreg thin bedded, some massive x-lam beds. Weathers shaly gray ledge. Has interbeds silty ss and gray siltstone
- 1.7 Sandstone, fine gr, soft, in thin beds with lam + thin beds of black carb sh.



8.0 Limestone grading to  
siltstone, upper 2' is  
clstg, slightly silty at  
base with dk gray zone  
at top, red gray.  
Then grad to thin gray  
silty clay to clayey  
siltstone, basal 0.7 is  
dark gray hard sandy  
siltstone

2.6 Sandstone, single massive  
ledge of fine gr ss with  
czob frags throught

4.4 Siltstone, <sup>inter</sup>bedded with  
hard with dark gray  
silty siltstone. Some lower  
lam. bedding due to part  
to water working. Czob frags.

4.8 Siltstone, part to  
thin bed with czob  
laminar. Dark shaly  
partings. Chiefly fine gr  
locally silty.

Fault Plane





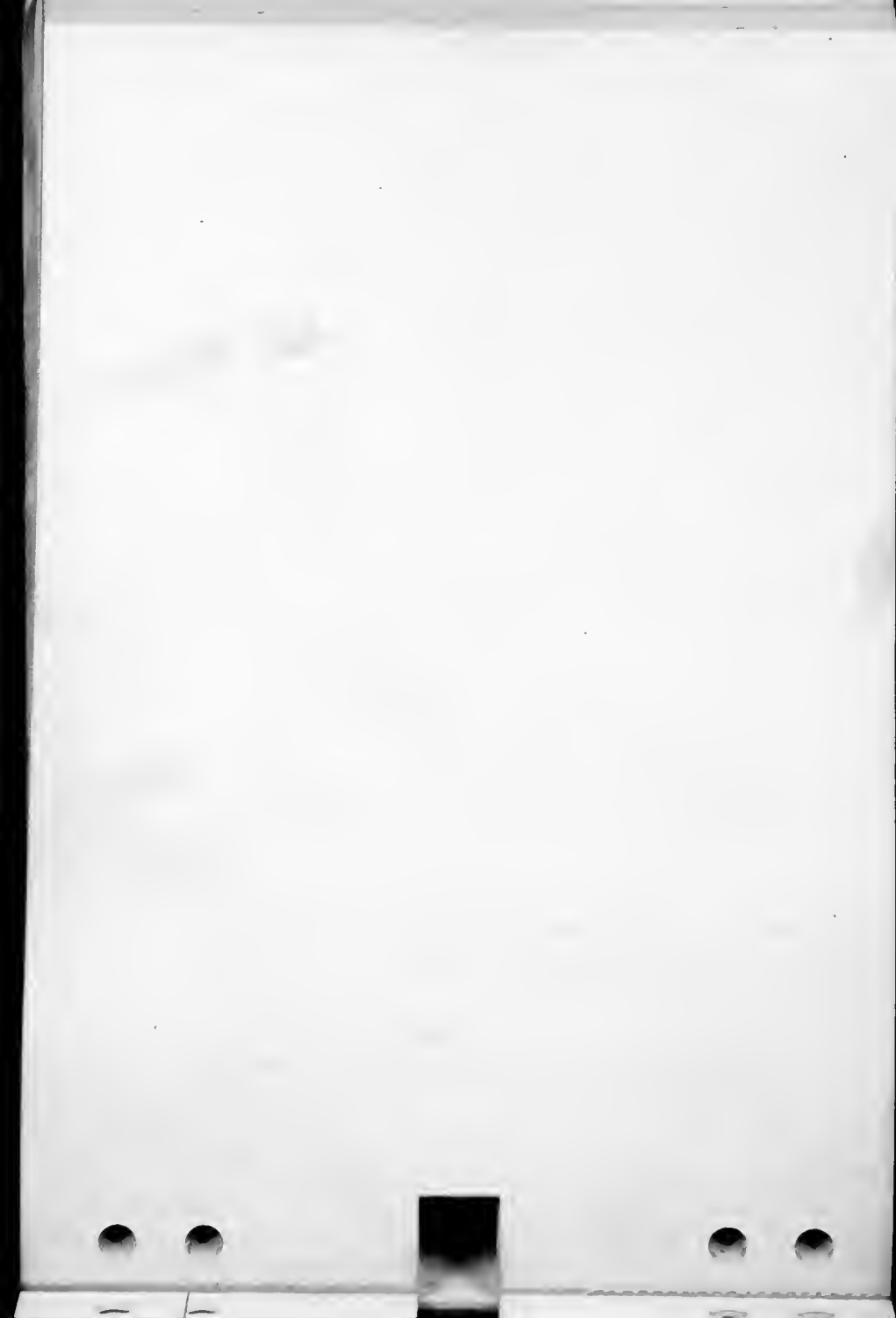
Edgemont area with Garland Gatl  
(Thursday Aug 4)

See Edgemont NE S. Dak. 7½ sheet, for localities noted below. (with packet of maps on Inyan Karz study)

Fall River: Variable succession chiefly because of local thick channel sands in upper part. At Loc. A. which is just off map, can see upper FR ss., then dominantly clayey succession and another ss just above creek. Clayey beds include a varicolored zone - chiefly red, which is in same approx. position in relation to upper FR ss as that at Rapid City and, possibly, that in road cuts off Wyo 111 across N. Bearlodes in Crook Co. This zone should be fairly persistent if it is a good genetic change. Worth checking its relative position in Devils Tower area.

In Red Canyon Cr. cut an excellent exposure of channel ss coming in abruptly in upper part of clayey zone and truncating the varicolored clays. Cuts them out abruptly to W. Garland

[cont. N+bk 5(55), IK #3, p.1]



W-21

Fall River Valley, 5 mi. S. Hot Springs S.D.  
 Evan's quarry on ~~W.~~<sup>S.</sup> wall where river  
 cuts into thick massive ss. If quarry  
 face is in type then Fall River is  
 not what we are taking it as. This  
 should be cleared up.

Skull Creek (in part.)

(22)

3.0-?

Shale, black to dk gray,  
 siliceous, some Fe scales  
 1.5' from base

(21)

2.5

Shale, black to dk gray, some  
 very fine lam silt with  
 gyp, possibly thin lenticles  
 locally?, in upper 1';  
 lower 1.0 is thin porcelanous  
 scatt. gyps Fe spongy cones  
 at top silt zone

(20)

7.8

Shale, dk gray to black fissile  
 at top and base with <sup>micro</sup>gyps.  
 weathered to 1.0-2.0  
 wide 2.5 to 3.0' from top  
 Sample A - very sandy, from  
 this siltier zone

6436

VP only

(19)

4.7

Shale  
 Dk gray to black - fissile

T

O: 1 0-1 55



(18)

7.4

Shale, chiefly, as above  
somewhat silty in upper  
1.5 ±

(17)

10.0

Shale, as above, zone 0.4 ±  
gray flat limst. concs  
at top. Some soft, fr  
stained 1st concs at about  
5' from top.

Shale, as above, zone  
0.3 ± conc limst. concs  
at top. Shale is silty  
throughout.

(16)

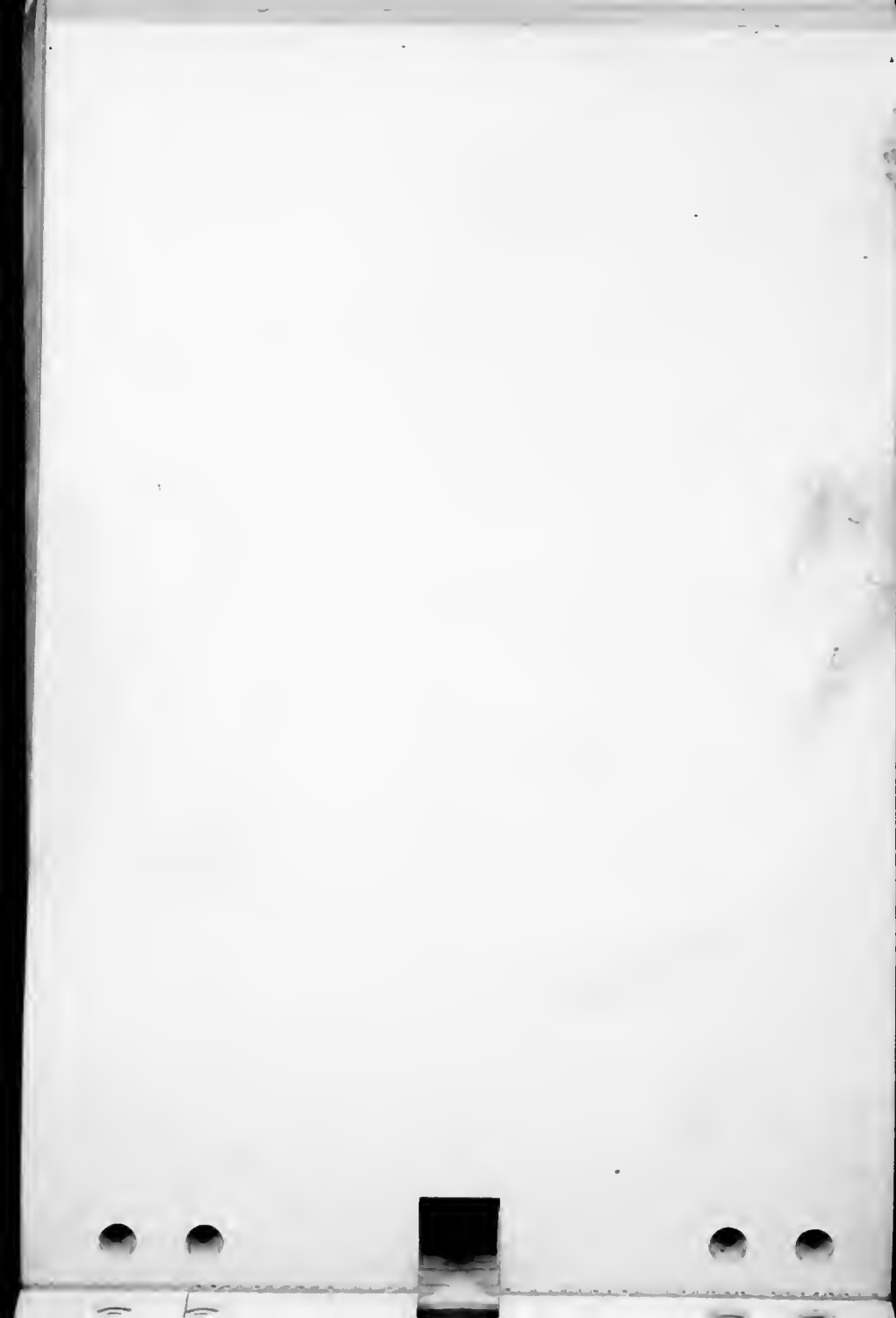
24.0

Shale, as above, question  
interval, may be 10' ±  
short due to slumping.  
Loc irreg ls lens 3' ±  
from top.

(15)

3.8

Silty sh + sh Upper 0.5  
gray. Shale local fossil  
concs. Then about 1.5  
blk sh, then 1.3 tough  
black clay with fr red  
& rusty stain, latter  
silty zone.



(14)

2.2,

Shale black, silty in lower half with silt stained parts

Fall River contact

(13)

2.0

Interbedded silts & silty sh. Juvenile large gray fossiliferous fine gr. upper section stained, plugs gray fine shaly

(12)

(12A) 4.8

Shale, thin, fine gr. loc x-bedded, upper part more silty, lower part more shaly, beds to 1.0

(12B) 14.8

Shale, thin, fine gr. loc x-bedded, upper part more silty, lower part more shaly, beds to 1.0

At 10.2 ... river from Powerhouse N. the Unit A thing ... lower massive part ... with wnt track.





(11)

6.0 ± Siltstone, laminated with  
bl. shaly plates, in thin  
beds, light gray-white,  
with some irreg interbeds  
~~ss in upper part~~. Weathers  
gray with red & yellow  
stain, lower 1.5 ± chiefly  
~~fine gr~~ lam siltstone.

This unit goes sandy  
1st, weath. thin Fe impreg  
x bedded ss.

(10)

2.0 ±

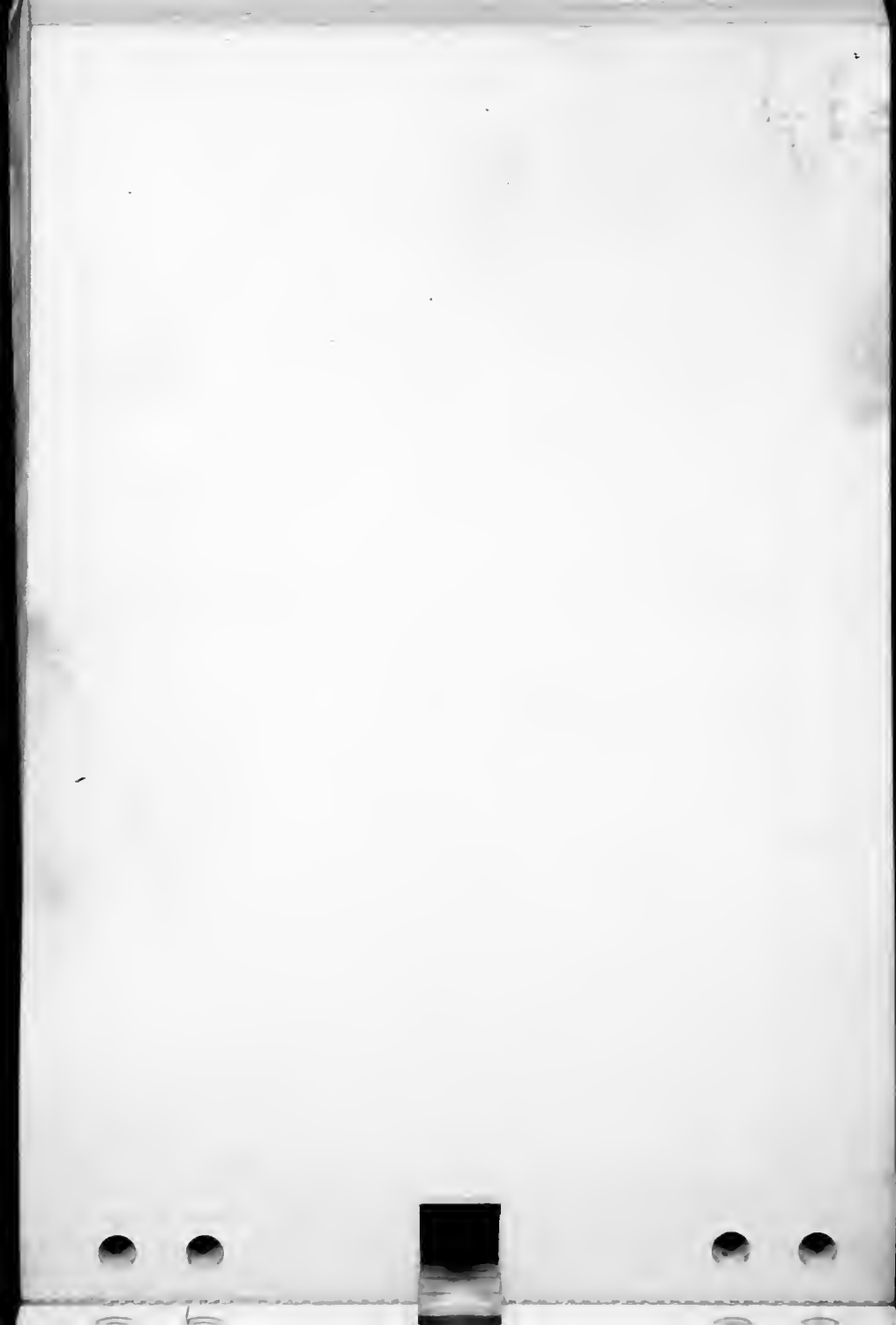
Note up-  
per ss.  
med-coarse

Sandstone over bl. bed-  
x bedded x lam, brown  
weath. fine-med Fe  
impreg cap on upper  
2 inches ±. Some gray  
shaly silt plugs & red  
stain on weath. Weathers  
buff to brown  
some shale inter in irreg  
base, also layers coarse  
ss at base & some  
clay pellets.

(9)

10.0

Claystone, light gray to  
dk gray & greenish gray  
local purple mottling.  
Locally silty, common 60



(8)

6.7

silty base grading to siltst.  
below. Laterally variable, yellow  
st. below mid bl. band - splenetic  
Siltstone, upper 0.9 a bed  
some red silt, rest  
silty, clayey, loc.  
carb., plant frags & much  
fine to coarse. Lys. by  
locally ink gray to  
black, lower Fe stain  
O.K. & becoming locally  
ss2.0. coarse in under black  
red beds below loose sand  
or brown of some pink  
gray at base -

(7)

4.2

ss to siltst. dark red  
fine to med, fine gr  
weakly bedded, loc Fe stain,  
/

(6)

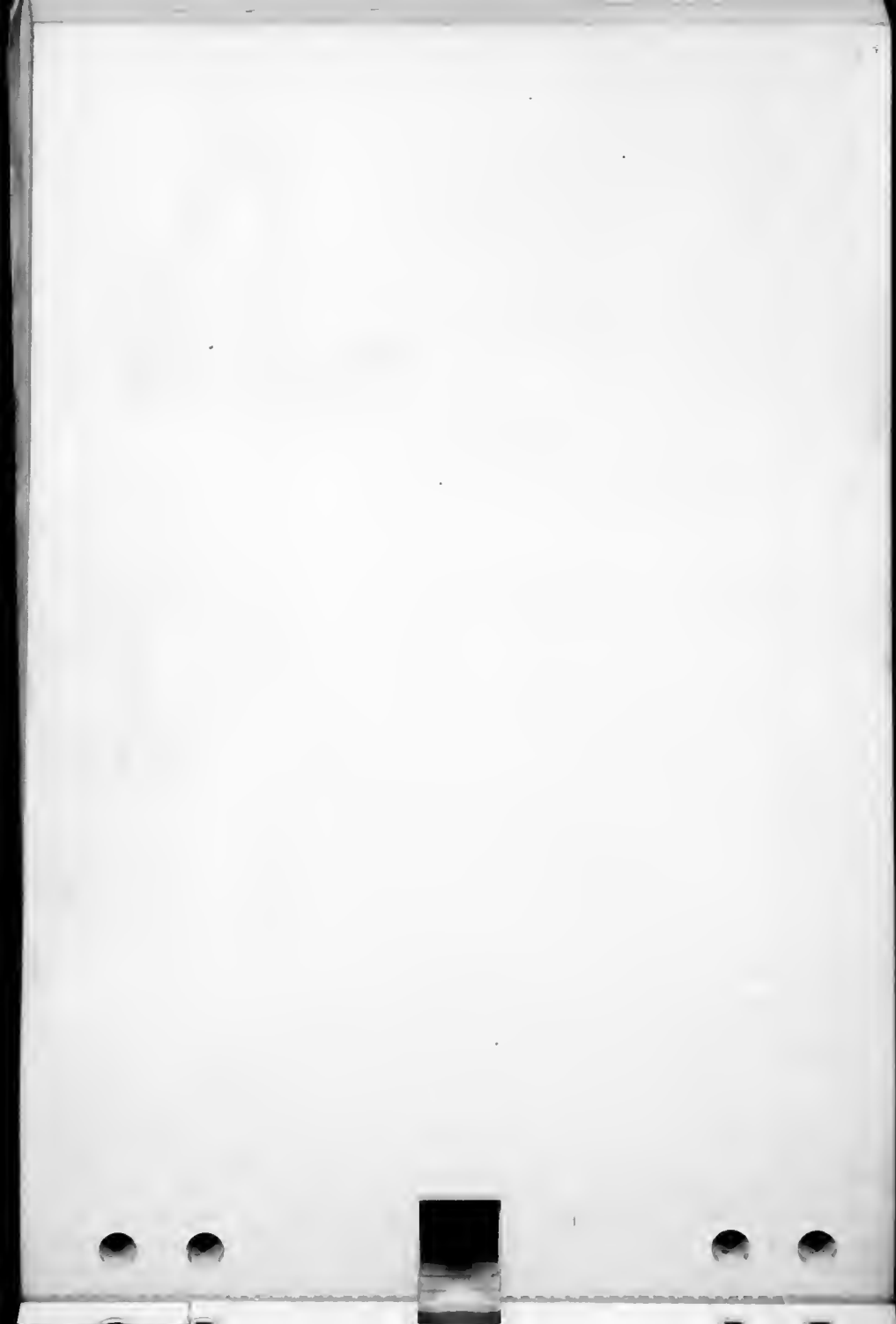
4.0

Siltstone, upper 4.0± silty  
ss to siltst. in middle part.  
Gray clayey upper  
with Fe spec. giving  
purple to pink cast  
Lower is gray claystone.

(5)

5.2

Sandstone, overlies to  
thin bedded, some Fe stain  
beds, micaceous.



(4)

3.0 Silty, silty gray to  
brownish gray thin  
ss interbeds. Upper  
1.5 clayey platy ss  
sh ply.

(3)

0.2-0.5 Cal, nodular

(2)

0 -0.4 Carb hard silty sh & silty clay  
ss in lower 4 in.  
beds.

basal contact may be here or within 5.5 below.

(1)

5.5

Silty clay, silty clay  
sh. silty clay. Clayey sand  
greenish to silty sh & silty  
clay carb frags. friable.  
Upper 1/2, is,  
gray becoming red  
in mid part & gray  
at base. Some beds  
too fine spec. some  
pebbles in mid part.

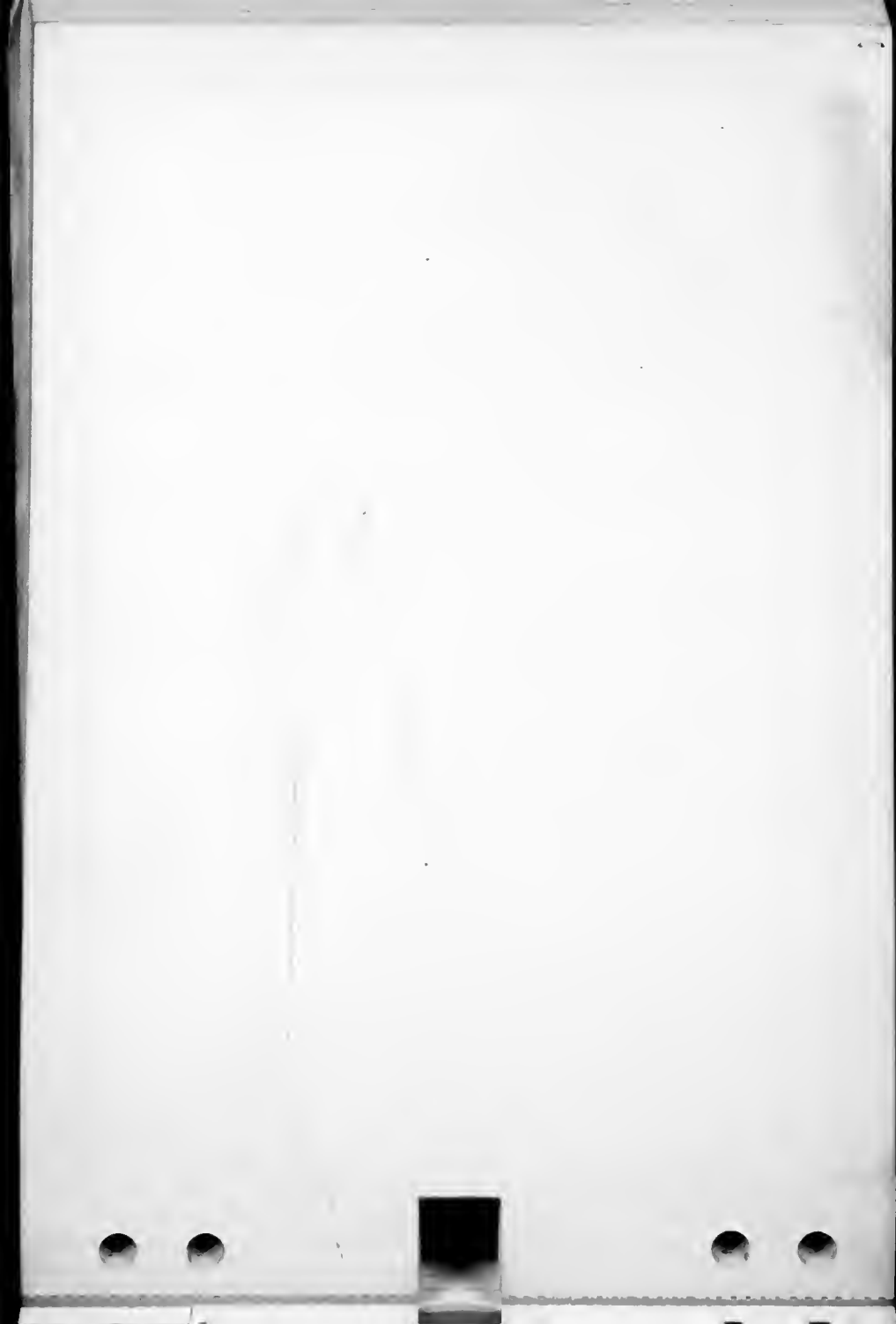
10.5

19.5

Sand, fine, massive,  
fine med. gr., basal 1'  
fine med. beds with shaly

2.0

Silty sh. silty gray,  
100% silty, clayey  
sh. silty.



3.0-? Sandstone, fine gr., brown weather,  
grades to siltstone, gray, as  
above

Looks to me like solution to type  
Fall River & its relation to the  
discontinuity I've been making  
its basal contact will have to await  
more detailed study & mapping  
of the area around the type.

Gzrlands

interp. has  
channel Fall River  
because its post-  
Fuson.

In Colo. more def.  
evidence that similar  
channel deposits, while  
post "Fuson" equiv (little) and  
also pre Fall River equiv.  
Question then is which  
break more signif in  
change from one geologic  
unit to other.



